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have periods 1 and 2 run over the same number of days. Among the animals there should be included several adults which had been brought to condition of underweight in the preliminary period with vitamine-free foods. This would answer any possible question concerning the effect of the intermittent growth impulse. It is hoped that others may be able to carry on this work.

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INTERFERENCE IN PRIMULA SINENSIS

OUTSIDE of *Drosophila,* the only data bearing on the question of interference of crossing over are those which I reported in a paper on linkage in *Primula sinensis.*[1] The phenomenon of interference—our knowledge of which in *Drosophila* dates from crosses made by Sturtevant and analyses made by Muller in 1912—consists of the fact that the occurrence of a crossing over in one region of a chromosome reduces the chances for the occurrence, in that cell, of another crossing over in a different region of the same chromosome; thus there is a smaller number of double crossovers than would otherwise be expected. The amount of interference is expressed by Muller's index called "coincidence," which is the ratio of the proportion of double crossovers actually observed in the experiment to the proportion of double crossovers which would have been expected to occur on the assumption that crossings-over in the two regions were independent of each other; the latter, or "expected" proportion of double crossovers is obtained by simply multiplying together the proportion of crossovers in one region by the proportion of crossovers in the other region. As I stated in my paper on *Primula,* a calculation based upon my total results could not be sufficiently reliable to decide the question of whether or not interference existed in *Primula.* This was on account of an uncertainty in the classification; I now find, however, that a calculation based upon a selected group of the plants, in which the uncertainty does not exist, is sufficient to decide the question in the affirmative—contrary to my earlier conclusion.

Three pairs of genes were involved in the *Primula* crosses—

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[1] Altenburg, E., 1916, Linkage in *Primula sinensis. Genetics,* 1: 354–366.

those for long style (l), red flower (r), and red stigma (s), allelomorphic respectively to short style (L), magenta flower (R), and green stigma (S). The order of the loci, as based upon 3684 individuals, was l r s; the per cent. of crossovers in the first region (between l and r) was 11.62, and that in the second region (between r and s) was 34.02. These relations, shown in a map, are as follows: $\frac{\text{l}}{0}\ \frac{\text{r}}{11.62}\ \frac{\text{s}}{45.64}$. The per cent. of double crossovers observed in the experiment was 2.52. According to the formula given above, the number of double crossovers to be expected if crossings over were independent would be 11.62 per cent. × 34.02 per cent., or 4.0 per cent., which, as I noted in the account of the case, exceeds the observed proportion of 2.52 per cent. This difference, then, between the observed and "expected" values in *Primula* would indicate that interference existed here, but, as I further stated, the difference was not significant because of the uncertainty which had attended the classification of flower color in the plants with the gene for green stigma. This gene caused the flower color to be lighter and obliterated somewhat the distinction between red and magenta.

In the plants with red stigma, however, the flower color was dark enough to render entirely certain the classification in regard to red and magenta; these plants, considered alone, would therefore furnish reliable data for determining the interference. I stated that, when these reliable plants alone were taken into account, no evidence of interference was to be found; but this conclusion was due to a numerical error in the calculation of the "expected" number of double crossovers, for I now find, in going over the figures, that the "expected" number is considerably higher than the number observed. Among the 1876 plants with red stigmas, there were 210 crossovers, or 11.2 per cent., in the first region, and 688, or 36.7 per cent., in the second region. The "expected" number of double crossovers is therefore 11.2 per cent. × 36.6 per cent., or 4.1 per cent. There were 54 double crossovers observed, or 2.9 per cent., giving a coincidence ratio of 2.9 : 4.1, or .7, instead of 1.00, which would be the ratio in the absence of interference. The difference between the "expected" and observed numbers is beyond the limits of random sampling, and it must therefore be concluded that interference exists in *Primula*. Although no reliance can be placed upon the precise value of the coincidence, it may be noted that this amount, .7, is just what would be expected for a similar distance in the X chromosome of *Drosophila melanogaster* (*ampelophila*).

It should be noted here that Haldane, in referring to my results in a recent article, called attention to the fact that the *Primula* data (using the counts of all classes of plants) fit his formula for expressing the relations between linkage values in *Drosophila.* Inasmuch as any formula expressing the linkage relations in *Drosophila* is necessarily the mathematical resultant of the operation of interference (interference of a type which diminishes with increasing distance), Haldane's statement that the *Primula* data fit the same formula as *Drosophila* is equivalent to saying that interference exists here, as in *Drosophila*; it is in this sense a restatement of my observation that the number of double crossovers found in the total count of the plants is smaller than the number "expected" in a case of a random occurrence of crossing over. It must further be noted that Haldane's formula for expressing the linkage relations in *Primula* is open to the same objection of unreliability as noted above, since his calculation is based upon all classes of plants, instead of upon just those classes which I showed must be used in any reliable determination.

The finding of interference in another organism, so widely separated from *Drosophila,* is of interest because of the bearing of interference on the general theory of linkage. Interference is not accounted for on Trow's form of the reduplication theory, although it was the earlier experiments upon *Primula* itself which largely supplied the data upon which this theory was founded.

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ON INTERSEXES IN FIDDLER CRABS.

NOT long ago a few specimens of small female fiddler crabs, *Uca pugnax,* were submitted to me by Professor T. H. Morgan for determination. They appeared to be normal, immature individuals and I so stated in my reply. In order to demonstrate the correctness of this view, a loan was made to Professor Morgan from the National Museum collection of a series of imma-